Offshore Renewable Energy and Marine Transportation, Navigation and Infrastructure

Potential effects of offshore renewable energy on marine transportation, navigation and infrastructure

(To be included in Chapter 8 Renewable Energy)

1. Offshore renewable energy may have some effects on marine transportation, navigation activities and other infrastructure in the SAMP area. Some effects may be negative, resulting in adverse impacts on these activities and uses, while others may be positive, resulting in enhancements. The degree to which offshore renewable energy structures may affect marine transportation, navigation and infrastructure varies in large part on the specific siting of a project. Careful consideration when planning the location of an offshore renewable energy facility, as well as the use of appropriate mitigation strategies, can minimize any potential negative impacts (Minerals Management Service 2007).

2. To date, most research on the potential effects of offshore renewable energy installations has been conducted in Europe, though some research has been conducted during the review of the proposed offshore wind farm project in Nantucket Sound by Cape Wind, LLC (U.S. Coast Guard 2009; Technology Service Corporation 2008). In anticipation of future offshore renewable energy development within the U.S., the U.S. Department of Interior Minerals Management Service (MMS) has identified potential impacts and enhancements of such development on marine transportation, navigation and infrastructure in the "Programmatic Environmental Impact Statement for Alternative Energy Development and Production" (PEIS) (Mineral Management Service 2007). In addition, the U.S. Coast Guard has issued a Navigation and Vessel Inspection Circular (U.S. Coast Guard NAVIC 02-07) to provide guidance on the information and factors the Coast Guard will consider, which include navigational safety and security, when reviewing a permit application for an offshore renewable energy installation in the navigable waters of the United States (U.S. Coast Guard 2007).

3. Offshore renewable energy facilities may affect navigational safety in a project area by increasing the risk of collision, limiting visibility, or limiting a vessel's ability to maneuver (Minerals Management Service 2007; U.S. Coast Guard 2007; BWEA 2007; U.K. Maritime and Coast Guard Agency 2008). However, collision risk was found to be low, especially when facilities are sited appropriately (e.g. Minerals Management Service 2007). Risks that have been identified include vessels colliding with offshore renewable structures themselves; with other vessels; or with ice that has formed on or around the structures during winter months. Moreover, visibility may be impaired surrounding an offshore renewable energy facility, as structures may block or hinder a mariner's view of other vessels, nearby land masses, or other navigational features (U.S. Coast Guard 2007; United Kingdom Maritime and Coast Guard Agency 2008). Obstructed visibility could potentially put a vessel at risk of collision or running aground. However, mitigation measures have been identified that can lower this potential risk to acceptable levels. For instance, mariners have been advised to follow required standard operating procedures, where applicable, as outlined in the International Regulations for Preventing Collisions at Sea (COLREGS) for limited visibility conditions. Adherence with these standard regulations can mitigate hazards to navigation caused by impaired visibility within an

offshore renewable energy facility (U.S. Coast Guard 2009; U.K. Maritime and Coast Guard Agency 2008). Offshore renewable energy structures may also limit the ability of some larger vessels to maneuver to avoid collision, as these vessels usually require greater stopping distances and have wider turning radii (U.S. Coast Guard 2007; U.S. Coast Guard 2009). The MMS PEIS (2007) notes that such impacts can be mitigated to acceptable levels by siting offshore renewable energy facilities so that they do not interfere with designated fairways or shipping lanes, and using appropriate signage and/or lighting to warn passing vessels (Minerals Management Service 2007, U.S. Coast Guard 2009). In addition, the U.S. Coast Guard considers all of these navigational safety issues when evaluating a permit application for an offshore renewable energy structure (U.S. Coast Guard 2007).

4. Whereas offshore renewable energy facilities may potentially displace marine transportation, military, or navigation uses, appropriate siting away from shipping lanes, military usage areas, or other intensively-used areas can minimize or eliminate any potential displacement of these uses (Minerals Management Service 2007). Vessels that cannot safely operate or navigate within an offshore renewable energy facility may be excluded from areas that were previously used, and therefore would need to alter travel routes in the vicinity of such projects (United Kingdom Maritime and Coastguard Agency 2008; U.S. Coast Guard 2007). Route alterations may potentially extend vessel travel times. The MMS PEIS (2007) notes that such impacts can be mitigated to acceptable levels by siting offshore renewable energy facilities away from designated fairways or shipping lanes. In addition, MMS (2007) expects that the military impacts of offshore wind farms will be negligible provided that development is coordinated with the U.S. Department of Defense and all appropriate military agencies.

5. Offshore renewable energy structures may affect the physical characteristics of a waterway, which include localized currents and sediment deposition and erosion (United Kingdom Maritime and Coastguard Agency 2008). Such effects are specific to shallow water systems, and can be minimized to acceptable levels through proper siting and mitigation methods (U.S. Coast Guard 2007; Minerals Management Service 2007). It should be noted that the potential renewable energy sites being considered through the Ocean SAMP are not shallow-water sites. Currents that are altered in direction and/or speed within or around an offshore renewable energy facility, may affect how vessels navigate through an area. In addition, structures that attach to the seafloor or extend through the water column may affect the surrounding water depth by altering sediment movement or deposition (Minerals Management Service 2007; U.S. Coast Guard 2007; United Kingdom Maritime and Coastguard Agency 2008). Consequently, if shoaling occurs, vessel navigation may be impacted within or around an offshore renewable energy facility. These effects may be most pronounced in predominantly shallow areas, or areas composed of highly mobile substrate (i.e. sands) with strong waves or currents. Mitigation measures may include installing scour-protection devices and monitoring sediment transport processes (United Kingdom Maritime and Coastguard Agency 2008; U.S. Coast Guard 2007; Minerals Management Service 2007).

6. Due to the large size of some offshore renewable structures, offshore renewable energy installations may interfere with the use of radar by ships or shore-based facilities within the area. However, interference may be negligible to minor when properly mitigated

(Minerals Management Service 2007; U.S. Coast Guard 2007; Technology Service Corporation 2008; Howard and Brown 2004; U.S. Department of Defense 2006). Studies have shown that ship and land-based radar systems may have some difficulty in detecting marine targets within an offshore renewable energy facility as the result of the distortion or degradation of radar signals by the installed structures (U.S. Coast Guard 2009; Technology Service Corporation 2008; Minerals Management Service 2007; U.S. Department of Defense 2006, BWEA 2007). Research conducted to assess the potential radar impacts of the proposed Cape Wind project in Nantucket Sound found that the facility would only pose adverse impacts in accurately detecting targets within and immediately behind the wind farm, as the installed structures may produce false targets or mask real targets (U.S. Coast Guard 2009; Technology Service Corporation 2008; United Kingdom Maritime and Coastguard Agency 2008). In other words, vessels navigating near but outside a wind farm may not be able to clearly identify, by radar, another vessel operating within the wind farm due to radar clutter. However, radar impacts observed within the wind farm can be mitigated to acceptable levels through greater attention by radar operators in distinguishing between real and false targets (U.S. Coast Guard 2009). No adverse impacts were found to occur between vessels operating completely outside, but within the vicinity of, the wind farm (U.S. Coast Guard 2009; Technology Service Corporation 2008). Because the severity of impacts to radar varies widely depending on site-specific characterizations, the U.S. Coast Guard considers impacts on navigation radar when reviewing a permit application (U.S. Coast Guard 2007).

7. Weather radar located near offshore renewable energy installations may also be adversely impacted by offshore renewable energy structures; impacts may include misidentification of thunderstorm features, false radar estimates of precipitation accumulation, and incorrect storm cell identification and tracking (Minerals Management Service 2007).

8. The installation of offshore renewable energy facilities may cause either minimal impacts or possible enhancements to navigation and communication tools and systems, including global positioning systems, magnetic compasses, cellular phone communications, very-high frequency (VHF) communications, ultra-high frequency (UHF) and other microwave systems, and automatic identification systems (AIS) (Minerals Management Service 2007, United Kingdom Maritime and Coastguard Agency 2008). The MMS PEIS (2007) indicates that any impacts are likely to be negligible to minor, and cites a number of studies in which no negative impacts were found. For example, Brown and Howard (2004) found no impact of wind farms on GPS accuracy and also noted that magnetic compasses, AIS, and VHF communications (ship-to-ship and ship-to-shore) were not affected within the wind farm installation. The U.S. Coast Guard requires permit applicants to conduct research on the potential impacts of an offshore renewable energy installation on navigation and communication systems prior to construction (U.S. Coast Guard 2007).

9. Search and rescue operations by agencies such as the U.S. Coast Guard, may be positively and/or negatively affected by offshore renewable energy installations (U.S. Coast Guard 2007; LeBlanc 2009). For example, installations may prolong the response time of search and rescue missions in cases where longer routes around the facility are required. Alternatively, offshore renewable energy structures may provide refuge to distressed mariners stranded or disabled within the vicinity of the facility (U.S. Coast

Guard 2007). When evaluating an offshore renewable energy permit, the U.S. Coast Guard will examine if an offshore renewable energy facility will prolong an agency's response time during a rescue mission (LeBlanc 2009). Previous research conducted to analyze the effects of offshore wind farms on search and rescue operations, involving helicopters, showed that radio communications and VHF homing systems worked satisfactorily, as did thermal imaging of vessels, turbines, and personnel within the wind facility (Brown 2005).

10. Operational offshore renewable energy facilities may provide enhancements to navigation and marine safety by providing mariners with access to in-situ offshore weather, wave and current data. This information may increase navigational safety by informing mariners of current offshore conditions, or providing a recent history of offshore conditions to aid in search and rescue operations within the area.

11. During the construction of an offshore renewable energy facility, vessel traffic may temporarily increase in a project area (Minerals Management Service 2007). Transits and operations of vessels involved in the transport of equipment and materials, facility construction, or the laying of submarine cables may temporarily increase (Minerals Management Service 2007). As a result, port facilities may also experience increased activity (Minerals Management Service 2007). Increased vessel activity may continue, albeit to a lesser extent, through the operation of the offshore renewable energy facility, as maintenance vessels will be required to service the installed structures. The presence of these vessels may increase the demand for port services, and enhance the economic activity associated with port facilities and marine industries.

12. Siting of offshore renewable energy facilities near pre-existing submarine cables may impact the security and accessibility of these cables. Such impacts can be mitigated to acceptable levels by considering pre-existing cables when siting offshore renewable energy facilities. Cable ships require a minimum distance from an offshore structure in order to safely access a submarine cable for repair or replacement (International Cable Protection Committee 2007). Offshore renewable energy installations whose location does not allow for safe access to existing submarine cables by the appropriate vessels may negatively impact the operation, performance, and longevity of this infrastructure (International Cable Protection Committee 2007). In addition, laying new submarine cables associated with an offshore renewable energy facility may require crossing existing cables in the area.

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